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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/981,076	10/16/2001	Thomas M. Tillotson	IL-10575C	6405

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EXAMINER
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HU, HENRY S

ART UNIT	PAPER NUMBER
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1713

DATE MAILED: 12/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/981,076

Applicant(s)

TILLOTSON ET AL.

Examiner

Henry S. Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on election of November 1, 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 9-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 9-17 is/are rejected.
- 7) ☒ Claim(s) 1, 15 and 16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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1. It is noted that this application 09/981076 filed on October 16, 2001, 2003 is a **DIV of 09/586426** abandoned on 06-02-2000 but was recently **revived** with a petition granted on 10-10-2003. It is also noted that the examiner has received a Pre-Amendment on claims filed on October 16, 2001, Claims 1-8 were cancelled and new Claims 9-20 were added.

In response to examiner's restriction requirement, **Applicants' election without traverse of Group I, Claims 9-17 as well as cancellation of Group II, Claims 18-20, filed on November 1, 2004 is acknowledged. Claims 9-17 are pending now. An action follows.**

#### **DETAILED ACTION**

##### ***Specification***

2. The disclosure is objected to because of the following informalities:

(a) **Page 1** at line 12, phrase with "filed September 9, 1997" should be changed to "**filed September 9, 1997 and now US Patent No. 6,666,935**" in order to update the current status.

(b) **Page 10** on Table 1 at line 3, some of the solvents has typographical errors and need to be fixed. For instance, methan, l-(?), and t-(?) are wrong. Please refer to Tables 3 and 5 as well as page 7 at lines 9-10 for correct names.

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(c) **Page 21** on Table 4 at line 18, recitation “2,3 epoxy(propyl) benzene” should be changed to “**2,3-epoxy(propyl)benzene**”.

(d) **Page 24** at line 24, recitation “ $M_{1x}O_y/M_2$ ” should be changed to “ $(M_1)_xO_y/M_2$ ” to be clarified with a correct formula. Otherwise one having ordinary skill in the art may be confused.

Appropriate corrections for (a) - (d) are required.

### ***Drawings***

## **3. INFORMATION ON HOW TO EFFECT DRAWING CHANGES**

### **3-1. Correction of Informalities -- 37 CFR 1.85**

New corrected drawings must be filed with the changes incorporated therein. Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and centered within the top margin. If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings **MUST** be filed within the **THREE MONTH** shortened statutory period set for reply in the “Notice of Allowability.” Extensions of time may **NOT** be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

### **3-2. Corrections other than Informalities Noted by Draftsperson on form PTO-948.**

All changes to the drawings, other than informalities noted by the Draftsperson, **MUST** be made in the same manner as above except that, normally, a highlighted (preferably red ink) sketch of the changes to be incorporated into the new drawings **MUST** be approved by the examiner before the application will be allowed. No changes will be permitted to

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be made, other than correction of informalities, unless the examiner has approved the proposed changes.

### **Timing of Corrections**

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.185(a). Failure to take corrective action within the set (or extended) period will result in **ABANDONMENT** of the application.

Please make correction on **Fig. 1, Fig. 2 and Fig. 3** regarding the hand writing is not acceptable. It is noted that **different writing styles** are also used. **Typing** is suggested.

### ***Claim Objections***

4. Claims 1 and 15-16 are objected to because of the following informalities:

(a) On **Claim 1** at line 6, recitation of “in pH;” should be changed to “**in pH**,”. Please note that the Markush language is used.

(b) On **Claim 15** at line 2, recitation of “Al<sub>3</sub>O<sub>3</sub>” should be changed to “**Al<sub>2</sub>O<sub>3</sub>**”. Please refer to page 15 at line 15 for a correct name.

(c) On **Claim 16** at line 2, recitation of “(Fe(NO<sub>3</sub>))<sub>3</sub>9H<sub>2</sub>O” should be changed to “**Fe(NO<sub>3</sub>)<sub>3</sub> • 9H<sub>2</sub>O**”, while recitation of “FeCl<sub>3</sub>6H<sub>2</sub>O” should be changed to “**FeCl<sub>3</sub> • 6H<sub>2</sub>O**”. Please refer to page 10 at line 3 and page 19 at line 2 for a correct name.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. *The limitation of parent Claim 9 of the present invention relates to a sol-gel process for producing monolithic aerogels or xerogels containing nano-structured metal-oxide materials comprising (a) dissolving a metal salt in a solvent at least containing water to produce a solution, (b) inducing sol formation by one of the group consisting of natural formation, change in pH, change in ionic strength, and change in temperature, (c) adding a proton scavenger to induce and control gelation for producing a gel, (d) providing sufficient time for gel formation, and (e) drying the gel to produce monolithic metal-oxide aerogels or xerogels. See other limitations of dependent Claims 10-17.*

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7. Claims 9-17 are rejected under 35 U.S.C. 103(a) as being obvious over Ong et al. (US 5,698,483) in view of Braithwaite et al. (US 3,981,979) or Ryang et al. (US 5,962,608), each individually.

Regarding the limitation of parent **Claim 9**, **Ong et al.** disclose a process for producing nano-particle size powders comprising the steps of mixing **an aqueous continuous phase comprising at least one metal cation salt** with a hydrophilic organic polymeric disperse phase (abstract, line 1-5; column 4, line 7-31). Ong et al. further disclose that **the formation of gel can be obtained** by stirring the polymer-to salt solution with a spatula in working **Examples I- VI** (column 5, line 30 – column 6, line 34). **Upon calcination of the salt/polymer mixture** at very high temperature up to 500 °C, the polymer is decomposed leaving a high-surface metal oxide powder having a nanometer particle size (column 4, line 43-49).

8. Ong is silent about the specific step (c) of **adding a proton scavenger such as epoxide to metal salt solution**. On one way, **Braithwaite et al.** teach that **lower aliphatic epoxide compounds** can be added with the metal oxide precursor such as aluminum salts (abstract, line 1-4 and column 2, line 31-37), the advantage is such an addition would effectively result in the formation of **alumina in the gel form** (column 1, line 12-38). On the other way, **Ryang et al.** teach that **epoxy resins** can be added with the metal oxide precursor (column 10, line 33-67). The advantage is that epoxide groups can condense with the hydroxyl groups to form polymeric

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molecules, which vary in size according to the relative proportions of reactants and the reaction time (column 9, line 15-17).

Therefore, one having ordinary skill in the art would have found it obvious to modify Ong's process by including the step of epoxide addition as taught by either Ryang or Braithwaite. The advantage is such additional step will allow hydroxyl groups from metal oxide precursor to condense with the epoxide groups and **to form polymeric molecules, which will be compatible with the added other polymers or additives, thereby result a nano-composite with better stability due to a higher molecular weight.**

9. Regarding **Claim 10**, the drying process is used at very high temperature up to 500 °C as discussed in Claim 9.

Regarding **Claims 11-13**, all the additional process steps are conventional and have been disclosed in the above-mentioned references.

Regarding **Claims 14-16**, Ong et al. has disclosed that metal cations of metal salts used in the process can be selected from the group consisting of at least one metal of Group 1A, 2A, 3A, 4A, 5A and 6A of the Periodic table, transition metals, lanthanides, actinides and mixture thereof (column 5, line 1-5).



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Regarding **Claim 17**, each of Ryang or Braithwaite has disclosed using **epoxide compounds or epoxy resins**, which are reading on the limitation of Claim 17 as being an **oxacyclo-alkane**.

10. Claims 9-17 are rejected under 35 U.S.C. 103(a) as being obvious over Imamura et al. (US 5,788,950) in view of Braithwaite et al. (US 3,981,979) or Ryang et al. (US 5,962,608), each individually.

Regarding the limitation of parent **Claim 9**, **Imamura et al.** disclose a process for the synthesis of **mixed metal oxide powders or complex oxide ceramic powders**, which is useful in co-precipitation and sol-gel routes (title; abstract, line 1-20; column 2, line 1-44). A metallic salt compound is used as metal oxide precursor, and acetone or ethanol is used as a co-solvent with water (column 1, line 49-51; column 7, line 8-12). Imamura et al. further disclose that **the formation of gel can be obtained** by changing the pH and/or temperature of the swollen gel (column 10, line 41-53; also see working **Examples 1-5** in column 12, line 5 – column 14, line 31). Upon **pyrolysis or calcination** at very high temperature up to 400 °C, a high-surface mixed metal oxide powder having a nanometer particle size was obtained (column 10, line 60 – column 11, line 57).

11. Imamura is silent about the specific step (c) of **adding a proton scavenger such as epoxide to metal salt solution**. On one way, **Braithwaite et al.** teach that **lower aliphatic epoxide compounds** can be added with the metal oxide precursor such as aluminum salts

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(abstract, line 1-4 and column 2, line 31-37), the advantage is such an addition would effectively result in the formation of **alumina in the gel form** (column 1, line 12-38). On the other way, **Ryang et al.** teach that **epoxy resins** can be added with the metal oxide precursor (column 10, line 33-67). The advantage is that epoxide groups can condense with the hydroxyl groups to form polymeric molecules, which vary in size according to the relative proportions of reactants and the reaction time (column 9, line 15-17).

Therefore, one having ordinary skill in the art would have found it obvious to modify Imamura's process by including the step of epoxide addition as taught by either Ryang or Braithwaite. The advantage is such additional step will allow hydroxyl groups from metal oxide precursor to condense with the epoxide groups and **to form polymeric molecules, which will be compatible with the added other polymers or additives, thereby result a nanocomposite with better stability due to a higher molecular weight.**

12. Regarding **Claim 10**, the drying process is used at very high temperature up to 400 °C as discussed in Claim 9.

Regarding **Claims 11-13**, all the additional process steps are conventional and have been disclosed in the above-mentioned references.

Regarding **Claims 14-16**, Imamura et al. has disclosed that metal cations of mixed **metallic salts** used in the process can be selected from the group consisting of at least one metal

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from titanium, zirconium, yttrium, aluminum, barium, calcium, tungsten, hafnium, tin, copper, and mixture thereof (column 10, line 5-20).

Regarding **Claim 17**, each of Ryang or Braithwaite has disclosed using **epoxide compounds or epoxy resins**, which are reading on the limitation of Claim 17 as being an **oxacyclo-alkane**.

### *Conclusion*

13. The prior art made of record and not relied upon is considered pertinent to applicants' disclosure. The following references relate to a sol-gel process for producing monolithic aerogels or xerogels containing nano-structured metal-oxide materials:

US Patent No. **5,629,380 to Baldwin et al.** discloses a curable, structural epoxy adhesive composition comprising two parts: (A) a calcium salt and Mannich base catalyst, and (B) an epoxy resin (abstract, line 1-5; column 3, line 24-43). The reaction between metal ion and epoxide has been disclosed (column 3, line 44 –column 4, line 62). However, Baldwin fails to teach sol-gel process by mixing the claimed solution of present invention.

US Patent No. **5,726,247 to Michalczyk et al.** discloses a fluoropolymer nano-composite comprising **a fluoropolymer phase and an inorganic oxide phase** dispersed throughout and

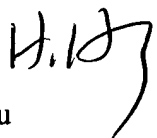
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having particles less than 75 nm (abstract, line 1-3; column 2, line 23-34). However, **no epoxide compound is included with metal oxide in the inorganic phase.**

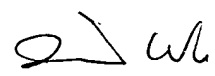
14. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Henry S. Hu whose telephone number is **(571) 272-1103**. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached on (571) 272-1114. The fax number for the organization where this application or proceeding is assigned is (703) 872-9306 for all regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Henry S. Hu

December 20, 2004

  
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SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700